DETAILED ACTION

Remarks

Claims 27, 30, and 38 are amended. Claims 27-28, 30, 33-36 and 38 are currently pending.

Status of Rejections

All rejections from the previous office action are withdrawn in view of Applicant's amendments. New ground of rejection is presented as necessitated by amendment.

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. The factual inquiries set forth in *Graham* v. *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

3. Claims 27-28, 30, 35-36 and 38 are rejected under 35 U.S.C. 103(a) as being unpatentable over Aoyama (US 2003/0024733), Komori (US 6265242), Bar-on (US 4695674) and Lindmayer (US 4057439).

As to claim 27, Aoyama teaches a solar cell module comprising: a first solar cell having front and rear surfaces, a first bus bar on the front surface having a longitudinal direction (2), an inner lead for (capable of) electrically connecting the first bus bar to a second bus bar of a second solar cell, wherein in a plan view the bus bar is wider than the lead such that there exists a first region of the bus bar connected to the lead and a second region including an edge portion parallel to the longitudinal direction that is nearer the edge than the first region (figure 6). Aoyama teaches that the lead configuration solves the problem of unwanted solder flow past the lead width (figure 2B versus prior art figure 7A and [0056]). Therefore the second region is solder free. Aoyama is silent to the particulars of the rear solar cell surface and therefore specifically a second bus bar on the rear surface, the second solar cell to which the lead is connected and a filler sealing the bus bars and lead.

Komori teaches a first solar cell with a bus bar on the light receiving side connected serially to the bus bar of a second solar cell located on the non-light receiving side (figure 7B and col. 24, lines 1-35). Bar-on teaches preformed bus bar and finger electrodes for a solar cell wherein the finger electrodes (15) meet the bus bar edge (14, second region) (figure 3) solving in situ fabrication problems including holes, voids and defects which lead to shorts in the cell, as taught by Bar-on (col. 1, lines 55-65 and col. 2, lines 5-10 and 35-40). Lindmayer teaches encapsulating serially connected solar cells for their protection from ambient conditions (claim 1 and figure 2). It would have been obvious to one of ordinary skill in the art at the time of the invention to use the second bus bar on the rear surface of Komori in Aoyama in order to collect

current and output an electromotive force, as taught by Komori (col. 24, lines 1-35) wherein coupling solar cells in series increases voltage. It would have been obvious to one of ordinary skill in the art at the time of the invention to use the preformed finger/bus configuration of Bar-on in modified Aoyama to avoid shorts in the solar cell, as taught by Bar-on (col. 1, lines 55-65 and col. 2, lines 5-10 and 35-40). One of ordinary skill in the art at the time of the invention would have found it obvious to encapsulate the cells of modified Aoyama with filler in order to protect the cells from ambient conditions as taught by Lindmayer (claim 1 and figure 2). The Examiner notes that modified Aoyama reads on the instant claimed invention because modified Aoyama will have the finger electrodes connected at the second region of the bus bar (edge) in direct contact with the filler because Aoyama teaches that solder is prevented from the second region (figure 2B) and Bar-on teaches that the finger electrodes connect to the bus bar at the second region unobstructed by the bus (figure 3).

Further regarding claim 27, there will inherently be a degree of error in the width alignment of the inner lead and the bus bar electrode during the manufacturing modified Aoyama, thereby reading on the instant claimed invention. Reading the references as a whole, one would appreciate that modified Aoyama does not require exact alignment between the inner lead and the bus bar electrode such that it would have been obvious to one of ordinary skill at the time of the invention to reduce accuracy of alignment to increase speed of manufacturing while still providing an operational solar cell.

Regarding claim 28, modified Aoyama teaches that the inner lead has solder at its center portion in the width (Aoyama: figure 2A).

Regarding claim 30, modified Aoyama teaches that the finger electrodes are in contact with filler over their whole length (Aoyama: figure 2B; solder does not run from lead and Bar-on: figure 3; unobstructed connection of fingers with bus).

Regarding claim 35, modified Aoyama teaches that the second region is positioned on either side (2 not covered by 3) of the first region such that the first region is in the center from a plan view (2 covered by 3) (Aoyama: figure 6).

Regarding claim 36, there will inherently be a degree of error in the width alignment of the inner lead (first connected area) and the bus bar electrode (second connected area) and therefore the solder thereon during the manufacturing modified Aoyama, thereby reading on the instant claimed invention. Reading the references as a whole, one would appreciate that modified Aoyama does not require exact alignment between the inner lead and the bus bar electrode such that it would have been obvious to one of ordinary skill at the time of the invention to reduce accuracy of alignment (differing first and second connection areas) to increase speed of manufacturing while still providing an operational solar cell.

Regarding claim 38, there will inherently be a degree of error in the width alignment of the inner lead and the bus bar electrode during the manufacturing modified Aoyama, thereby reading on the instant claimed invention. Reading the references as a whole, one would appreciate that modified Aoyama does not require exact alignment between the inner lead and the bus bar electrode such that it would have been obvious to one of ordinary skill at the time of the invention to reduce accuracy of alignment such that the inner lead overlaps the finger electrode to increase speed of manufacturing

while still providing an operational solar cell. Modified Aoyama teaches controlling the amount of solder such that solder does not overflow onto the substrate and off the bus bar to avoid lowered power output efficiency of the solar cell (Aoyama: figure 2B and [0012]). Although modified Aoyama is specifically silent to a space between the inner lead and finger electrodes occupied with filler; it would have been obvious to one of ordinary skill in the art at the time of the invention to prevent solder from flowing onto the finger electrode ends such that filler comes into direct contact with the finger electrode ends to prevent lowered power output resulting from solder flowing off the bus bar, as taught by Aoyama ([0012]). As a result of the solder between the inner lead and the bus bar (to which the finger electrodes connect) there will inherently be a space between the finger electrode and inner lead and during encapsulation the filler will fill all spaces thereby reading on the instant claimed invention.

4. Claim 33 is rejected under 35 U.S.C. 103(a) as being unpatentable over Aoyama, Komori, Bar-on and Lindmayer as applied to claim 27 above and further in view of Tanaka (US 20020148499).

Regarding claim 33, modified Komori is silent to the solder specifically containing bismuth. Tanaka teaches a solar cell string which uses a lead free bismuth containing solder ([0019]) because lead is harmful ([0013]). It would have been obvious to one of ordinary skill in the art at the time of the invention to use the solder of Tanaka in modified Aoyama because the solder is a known material used for the same intended purpose and solving the same problem, lead free making it safe for the environment, as taught by Tanaka ([0013]) (MPEP 2144).

5. Claim 34 is rejected under 35 U.S.C. 103(a) as being unpatentable over Aoyama, Komori, Bar-on and Lindmayer as applied to claim 27, above and further in view of Lally (US 6198207) and Kujas (US 4685604).

Regarding claim 34, modified Aoyama teaches using a Sn based solder (table 2) but is silent to the solder having a sum of contraction (shrinkage) coefficients by weight percent less than 2.8%. Lally teaches a solder composition for an electronic device which has Sn and a shrinkage coefficient of 0.3% which reduces the residual stresses after solidification of the solder (col. 5, lines 44-60). It would have been obvious to one of ordinary skill in the art at the time of the invention to use the low shrink solder of Lally in modified Aoyama because the low shrinkage property reduces residual stresses, as taught by Lally (col. 5, lines 55-60) especially in light of the fact that the solar art has recognized the same problem: severe expansion and contraction of solder joints to promote stress and failure, as taught by Kujas (col. 1, lines 10-20).

Response to Arguments

14. Applicant's arguments with respect to claim 27 have been considered but are moot in view of the new ground of rejection necessitated by amendment. Applicant argues that the rejection does not teach a “solar cell module” as required by the instant claimed invention. The Examiner respectfully disagrees. The combination teaches all of the limitations of the instant claimed invention including a plurality of solar cells connected in series and encapsulated, thereby teaching a solar cell module.

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Contact Information

Any inquiry concerning this communication or earlier communications from the examiner should be directed to **MIRIAM BERDICHEVSKY** whose telephone number is (571)270-5256. The examiner can normally be reached on M-Th, 12pm-10pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jennifer Michener can be reached on (571) 272-1424. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/M. B./

Examiner, Art Unit 1723

/Jennifer K. Michener/

Supervisory Patent Examiner, Art Unit 1728